

Final Project Stage 2 –Benchmarking and LEED Points.

Complete the following Steps. **NOTE:** Consider only Life Cycle Stage A to C for all Impact Assessment results (ie. row 45 in Google Drive).

1 – Use the **CIVL 498C 2014 Database_031014.xls** file provided.

2 – Calculate a benchmark of all building impact assessment results and total material mass by m² for whole building and each respective element. **NOTE: exclude HENN and PHRM from the benchmark.**

3 – Determine how many MR LEED v4 points for ‘Building life-cycle impact reduction - Option 4’ your building would be awarded for whole building design as-is when compared to the whole building class benchmark previously calculated.

Upload the points outcome to your building’s tab on Google Drive in cell **G15**. **NOTE:** Refer to the LEED documentation requirements from the LEED Reference Guide provided, treat the whole building class benchmark as the baseline building, treat your building as the proposed building and assume same energy performance.

4 – Do some research and summarize brief comments on the accuracy of your building’s LCA model using the whole building class benchmark previously calculated. Specifically comment on whether [1] your building’s material takeoffs and impact assessment results are reasonable, [2] construction material EPDs are available for materials used in your building.

5 – Create a proposed design that achieves 3 LEED MR points for ‘Building life-cycle impact reduction - Option 4’ by changing material selection and assembly type in the IE4B for the respective building elements from Stage 1. Generate impact assessment results for each element and sum them in excel to benchmark against your whole building results from Stage 1. Summarize the inputs you have made changes to and which element they were in. Save the proposed 7 elemental files with the suffix “_Proposed”. **NOTE:** Refer to the LEED documentation requirements from the LEED Reference Guide provided, treat your Stage 1 model as the baseline building, the building you create as the proposed building and assume same energy performance.

Mark Distribution:

This assignment is **10%** of your final grade (increased from 5%). 2% for submitting by **midnight Oct. 14th**, and 8% for carrying out the Stage 2 steps correctly as demonstrated by your submissions. Submissions for Step 2 and 3 are worth 1% each, and submissions for Steps 4 and 5 are worth 3% each.

Summary of Submissions

Create a folder for Stage 2 in your 2014 dropbox and upload a pdf document with the following deliverables.

- Step 2 – **10** tables with class IE4B impact assessment and total material mass benchmarks (ie. average) for each element and whole building.
- Step 3 – 1 table showing whole building class benchmark and your building's impact assessment results, and % difference (relative to class benchmark). Upload points outcome for LEED v4 Impact Reduction – Option 4.
- Step 4 – [1] A paragraph summarizing research sources and your comments on accuracy of building LCA results. [2] List a minimum of 3 EPDs that could be used in your building LCA model.
- Step 5 – 1 table showing the 7 elements and any changes that were made within them to achieve the 3 LEED points. 1 table showing whole building class benchmark and your building's impact assessment results, and % difference (relative to class benchmark). The 7 elemental files uploaded with suffix “_Proposed”.

Suggested formats

- Step 2

Element	Impact Category or Material Mass (units/m ²)		
	Baseline	Proposed	% Difference
A11 Foundations			
A21 Lowest Floor Construction			
A22 Upper Floor Construction			
A23 Roof Construction			
A31 Walls Below Grade			
A32 Walls Above Grade			
B11 Partitions			
Whole Building			

- Step 3

Impact Categories	Units	Baseline	Proposed	% Difference
Global Warming Potential	kg CO2 eq			
Acidification Potential	kg SO2 eq			
Eutrophication Potential	kg N eq			
Ozone Depletion Potential	kg CFC-11 eq			
Smog Potential	kg O3 eq			
Non-Renewable Energy	MJ			

- Step 5

Element	Proposed Changes
A11 Foundations	
A21 Lowest Floor Construction	
A22 Upper Floor Construction	
A23 Roof Construction	
A31 Walls Below Grade	
A32 Walls Above Grade	
B11 Partitions	

Impact Categories	Units	Baseline	Proposed	% Difference
Global Warming Potential	kg CO2 eq			
Acidification Potential	kg SO2 eq			
Eutrophication Potential	kg N eq			
Ozone Depletion Potential	kg CFC-11 eq			
Smog Potential	kg O3 eq			
Non-Renewable Energy	MJ			

Useful Sources

- See file “LEEDv4_Reference Guide_LCAcredit” on Course Wikispace
- EPD Program Operator webpages:
 - CSA http://www.csaregistries.ca/epd/about_epd_pcrs_e.cfm
 - NRMCA <http://www.nrmca.org/sustainability/EPDProgram/Index.asp>
 - UL Environment
<http://productguide.ulenvironment.com/SearchResults.aspx?CertificationID=15&pageNumber=1>
 - FP Innovations https://fpinnovations.ca/ResearchProgram/environment-sustainability/epd-program/Pages/default.aspx#.VCMcK_IdUrU
 - CalStar <http://calstarproducts.com/epd/>
 - ASTM http://www.astm.org/CERTIFICATION/filtrex40.cgi?-P+PROG+7+cert_detail.frm
 - SCS Global <http://www.scsglobalservices.com/environmental-product-declaration>
 - Environdec <http://www.environdec.com/>